

Coweeta LTER 2018 Summer Meeting

June 19-20, 2018

PIs present: Rhett Jackson, Pete Caldwell, Chris Oishi, Jennifer Knoepp, Chelcy Miniati, Paul Bolstad, Fred Benfield, Jack Webster (Emeritus), Amy Rosemond, Seth Wenger, Nik Heynen, Nina Wurzburger, David Leigh, Taehee Hwang, Kim Novick, Bob Cooper

NSF update –Rhett Jackson

- Several sites were up for review this year and the outcomes of the review are just now starting to come in. Important results: Florida Coastal Everglades (FCE) and Jornada (JRN) were put on probation; Baltimore (BES) was terminated.
- No indication that there will be a call for new Eastern Forest LTER site. There is also no indication of where NSF is going with the LTER program.
- The All Scientists Meeting (ASM) is coming up. The NCO will pay for 7 positions plus the IM (Brian Herndon). Approx. 6 other CWT scientists and grad students will attend on CWT funds.
- Science Council update: Theme was organic matter. The topic lacked some of the energy of previous themes because: 1) there was a long, drawn-out argument about whether or not carbon budget should be part of organic argument; 2) we don't know much about DOC. One interesting discussion that came out of Science Council was that seemingly insignificant losses from one part of the ecosystem can make a major difference in another ecosystem. Some changes can be really important even though they are not necessarily easy to measure.
- SAC will discuss about using next summer's meeting about inviting past LTER PIs to give retrospective talks about their research while at Coweeta.

Coweeta Hydrologic Lab FS Research Priorities (Miniati)

- Budget not any better than last year – 3% cut. Budget shrunk \$1 million over past 8 years.
- For Coweeta (RWU4353), our mission is to:
 - Conduct long-term hydrologic and ecological research
 - Develop knowledge, methods and guidelines to evaluate the effects of natural resource management on forested watersheds
 - Develop a fundamental understanding of the structure and function of forested watersheds
- New employees include Becky Dobbs who will be working with Pete Caldwell on the GIS model of a nation-wide “forests-to-faucets” project, as well as Kai Duan, a post-doc who is also working with Pete
- Recently Completed Projects
 - **1) Fungal communities change along an elevation, N and moisture gradient**
Veach AM, Stokes CE, Knoepp J, Jumpponen A, Baird R. 2017. Fungal Communities and Functional Guilds Shift Along an Elevational Gradient in the Southern Appalachian Mountains. Microbial Ecology 1-13.
 - **2) Warmer temperatures reduce NEE but not forest water use**
Oishi, A.C., Miniati, C.F., Novick, K.A., Brantley, S.T., Vose, J.M., and Walker, J.T., 2018. Warmer temperatures reduce net carbon uptake, but do not affect

water use, in a mature southern Appalachian forest. *Agricultural and Forest Meteorology* 252:269–282.

- **3) Rhododendron creates a tree recruitment bottleneck, and influences canopy structure**
Bolstad, P.V., Elliott, K.J., and Miniati, C.F., Forests, shrubs and terrain: top down and bottom-up controls on mature deciduous forest structure. Ecosphere 9(4):e02185. [10.1002/ecs2.2185](https://doi.org/10.1002/ecs2.2185)
- **4) Rhododendron seedbank rich with tree seeds, despite negative effect on tree seedling recruitment**
Cofer, T.M., Elliott, K.J., Bush, J.K., and Miniati, C.F. Rhododendron maximum impacts seed bank composition and richness following Tsuga canadensis loss in riparian forests. Ecosphere 9(4): e02204-e02219.
- **5) Shading and infesting eastern hemlock increases foliar [N], [P] and [K]**
Lapham, M.L., Miniati, C.F., Mayfield, A.E., Jetton, R.M., Brantley, S.T., Zietlow, D.R., Brown, C.L., and Rhea, J.R. Shade and hemlock woolly adelgid infestation increase eastern hemlock foliar nutrient concentration. Forest Science (in press)
- **6) Sweetgum plantations result in negative local water balance**
Caldwell, P.V., Jackson, C.R., Miniati, C.F., Younger, S.E., Vining, J.A., McDonnell, J.J., and Aubrey, D.P., Woody bioenergy crop selection can have large effects on water yield: A southeastern United States case study. Biomass and Bioenergy (accepted w/ revisions)
- **7) Across all community forest types, NPP and litterfall N & C flux increase over 20 yrs, but no change in mineral soil pools**
Knoepp, J.D., See, C.R., Vose, J.M., Miniati, C.F., and Clark, J.S., Total C and N pools and fluxes vary with time, soil temperature, and moisture along an elevation, precipitation and vegetation gradient in southern Appalachian forests. Ecosystems 48: 921-936.
- **8) WS7 species shift following clearcut result in less water yield**
Jackson C.R., Webster J.R., Knoepp J.D., Elliott, K.J., Emanuel, R.E., Caldwell, P.V., and Miniati, C.F. 2018. Unexpected ecological advances made possible by long-term data: A Coweeta example. Wiley Interdisciplinary Reviews: Water. 39: e1273-. <https://doi.org/10.1002/wat2.1273>
- **Some Projects Nearing Completion**
 - *Singh, N.K., Emanuel, R.E., Nippgen, F., McGlynn, B.L., and Miniati, C.F. Hierarchical influences of shallow groundwater responses to storms in forested headwaters. Water Resources Research (in review)*
 - *Amos, H., Miniati, C.F., Lynch, J., Compton, J., Templer, P., Sprague, L., Shaw, D., Burns, D., Rea, A., Whittall, D., Myles, L., Rose, A., Walker, J., Nilles, M., Gay, D., Bales, J., Deacon, J., and Pouyat, R., What Goes Up Must Come Down: Integrating Air and Water Quality Monitoring. Frontiers in Ecology and the Environment (in review)*
 - *Elliott, K.J., and C.F. Miniati. Herbaceous-layer diversity and tree seedling recruitment are enhanced following Rhododendron maximum shrub removal. Forest Ecology and Management. (in review)*
 - *Osburn, E., Elliott, K.J., Knoepp, J.D., Miniati, C.F., and Barrett, J.E. Soil microbial response to Rhododendron understory removal in southern*

Appalachian forests: effects on extracellular enzymes. Soil Biology and Biochemistry (in review)

- *Brantley, S.T., Miniati, C.F., and Bolstad, P.V. Rainfall partitioning varies across a forest age chronosequence in the southern Appalachian Mountains. Ecohydrology (in prep)*
- *Minucci, J.M., Miniati, C.F., and Nina Wurzbarger, N. Drought sensitivity of N₂-fixing trees may inhibit temperate deciduous forest recovery from disturbance. Ecology (in prep)*
- *Hawthorne, S.N.D, Elliott, K.J., and Miniati, C.F. Forest species recruitment and growth response following *Tsuga canadensis* mortality. Forest Ecology and Management (in prep)*
- LTER Tech Katie Bower and USFS Tech Chris Sobek spent two weeks in Puerto Rico helping to install new climate sensor arrays in El Yunque and Guayama Research Area. These sensor arrays were destroyed or damaged by Hurricanes Irma and Maria.

Jennifer Knoepp, Taehee Hwang, Nina Wurzbarger, Rhett Jackson, Maura Dudley, Amy Rsoemond, Kelly Peterson, and Chris Oishi presented new science. Presentation abstracts previously provided by Jason Love. Jason Love presented the CWT vertebrate species list he has developed. Ed Johnson presented the plans for the post wind-down static LTER website.

Group Discussions (led by Rhett Jackson)

1. Pests, invasions, land use, and climate change in eastern Appalachian forests: relative and layered effects and feedbacks

Ecosystems today are increasingly structured by human actions. What are the magnitudes of change and what are the spatial dimensions? Human impacts might be more significant than what we give it credit for. What are the response variables and effects. What scale are we talking about?

Even if we meet CO₂ reduction, it takes a really long time to course-correct the problem of rising CO₂. We need to show that there is a laundry list of things that are more directly impacted by human activities than climate change and that these changes are relatively easy to make, at least compared to the changes required to mitigate climate change.

What do we want people to take away from this information? What is the “so what” factor? The effects in feedback from climate change are going to take so long and we won’t have the societal wherewithal to take action, but direct human impacts are easier to understand and can be acted upon. Here are the resilient pieces that we have that can be acted upon before it is too late.

Streams could be the common link between all the themes.

We need to show the accumulated effect of all the stressors. We need a paper about resilience. Two papers- one about how resilience the systems are and another about how we can add resilience to the system.

2. Synthesis of regional stream studies

Over the past 20 years, CWT researchers have published approximately 40 studies of water quality conditions across the region, mostly focusing on the Upper Little Tennessee River Basin. Foci have included macroinvertebrates, fish, salamanders, sediment, nitrogen, and leaf litter breakdown. These studies have consistently found that moderate amounts of forest conversion (less than 35%) to small valley farms and rural residential lands results in streams with:

- Much higher storm TSS and higher sediment loads,

- Elevated DIN,

- Elevated specific conductivity,

- Narrow and simple channels without wood,

- Elevated summer stream temperatures beyond cold water taxa tolerance, and

Highly altered biotic assemblages. Changes in presence/absence and abundance are specific to individual taxa and watersheds and also partly driven by elevation and network position. Biological conditions are often more strongly associated with previous rather than current land use.

The group is putting together an outline for a synthetic paper and will work on it by email and revisit it at the winter meeting.